MULTIPLE CHOICE QUESTIONS:

1. D	6. B	11. D	16. B	21. C	26. B	31. C	36. D
2. A	7. A	12. A	17. C	22. C	27. B	32. C	37. A
3. D	8. A	13. C	18. C	23. A	28. A	33. C	38. D
4. C	9. B	14. B	19. C	24. A	29. C	34. B	39. A
5. C	10. A	15. B	20. B	25. A	30. A	35. D	40. A

WRITTEN ANSWER QUESTIONS:

1. DNA is a double-stranded polymer of nucleotides. Its strands are held together by hydrogen bonding between complementary distinct from RNA in terms of nucleotide structure (deoxyribose instead of ribose; thymine instead of uracil). DNA is double- RNA is a single-stranded molecule. Finally, DNA is much longer than RNA (RNA is produced from a single DNA gene).

2. The three functions of DNA and their biological significances are:
   a. Replicate (make copies of itself). This is significant for cell division as each daughter cell requires the correct number of chron
   b. Control protein synthesis. The specific base sequence of DNA ultimately determines which amino acids will be incorporated to be formed.
   c. Mutate. The base sequence of DNA can be altered through mutations, which changes the ability of the cell to produce a spec impacting some aspect of cell metabolism.

3.

Bases of Contrast	[illegible]	Codon	[illegible]
Location	DNA	mRNA	tRNA
Structure	sequence of many bases (A, T, G, C) comprising a gene	sequence of a selection of three bases (A, U, G, C) complementary to a sequence contained in the code	sequence of a selectio bases (A, U, G, C) comp to a sequence contain codon
Function	ultimately determines which amino acids should be incorporated into an amino acid that is to be constructed	is the transcribed message for a particular amino acid; takes this message to the ribosomes	transports amino a ribosomes during tra

4. The three types of RNA and their functions are:

1. DNA is a double-stranded polymer of nucleotides. Its strands are held together by hydrogen bonding between complementary bases. DNA is distinct from RNA in terms of nucleotide structure (deoxyribose instead of ribose; thymine instead of uracil). DNA is double-stranded where RNA is a single-stranded molecule. Finally, DNA is much longer than RNA (RNA is produced from a single DNA gene).

2. The three functions of DNA and their biological significances are:
   a. Replicate (make copies of itself). This is significant for cell division as each daughter cell requires the correct number of chromosomes.
   b. Control protein synthesis. The specific base sequence of DNA ultimately determines which amino acids will be incorporated into the protein to be formed.
   c. Mutate. The base sequence of DNA can be altered through mutations, which changes the ability of the cell to produce a specific protein, thus impacting some aspect of cell metabolism.

3.

Bases of Contrast	DNA	mRNA	tRNA
Location	DNA	mRNA	tRNA
Structure	sequence of many bases (A, T, G, C) comprising a gene	sequence of a selection of three bases (A, U, G, C) complementary to a sequence contained in the gene	sequence of a selection of three bases (A, U, G, C) complementary to a sequence contained in the gene
Function	ultimately determines which amino acids should be incorporated into an amino acid that is to be constructed	is the transcribed message for a particular amino acid; takes this message to the ribosomes	transports amino acids to ribosomes during translation

4. **The three types of RNA and their functions are:**
   a. **mRNA – transports the transcribed DNA base sequence to the ribosome for translation.**
   b. **tRNA – transports amino acids to the ribosome during translation.**
   c. **rRNA – the component of ribosomes that ensures correct alignment of the mRNA for translation.**

5. A start codon marks the beginning of the mRNA strand and thus governs the incorporation of the first amino acid (methionine) into the sequence. Stop codons mark the end of the mRNA strand. The tRNA molecules with the corresponding anticodon for a stop codon do not carry an amino acid. As a result, the assembly of amino acids into the sequence is halted.

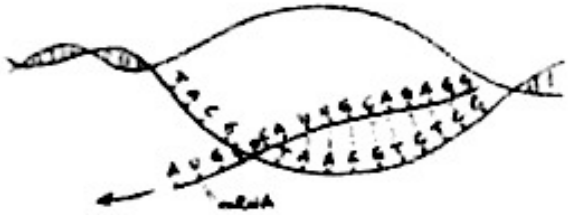
6. The DNA segment contains 120 nucleotides. There are 26 Guanine nucleotides, and therefore also 26 Cytosine nucleotides (DNA is double-stranded and these bond together.) As well, there are 34 Adenine nucleotides and 34 Thymine nucleotides, which all adds up to 120.

7. a. Base deletion occurs when an intended nucleotide is left out of the sequence that is being formed. The new DNA strand that is produced is, therefore, one nucleotide short. This has a disastrous effect on the protein that would be coded for by this strand because the triplet codons that would be formed from it would (most likely) be incorrect from the point of the deletion on to the end of the strand.
   b. Base addition occurs when an additional nucleotide is incorporated into the sequence that is being formed. The new DNA strand that is produced is, therefore, one nucleotide longer than it should be. This has a disastrous effect on the protein that would be coded for by this strand because the triplet codons that would be formed from it would (most likely) be incorrect from the point of the addition on to the end of the strand.
   c. Base substitution occurs when the incorrect nucleotide is incorporated into the strand that is being produced. This very often means that the mRNA strand produced from this segment of DNA has a single codon that codes for an incorrect amino acid. If it does, the resulting protein will have an error in it and the molecule will not function as it is intended. However, the Genetic Code is degenerative, meaning that many substitutions, particularly when they are in the third position, do not have any bearing on the protein that is made. In these cases, the protein will be correct and the mutation will not be manifested phenotypically.

8. a. and b. (at right)

   c. Replication is the process where replicas of DNA molecules are made. The resulting molecules are identical because each one is formed from one of the parent strands by complementary base pairing.

9. a, b, and c.



   d. The product of transcription is mRNA. The process occurs in the nucleus, and the newly constructed mRNA leaves through a nuclear pore and travels to a ribosome where it is involved in translation.

10.

   e. The product of translation is protein. The proteins can be considered in two groups depending on the location of the ribosome involved. If the ribosome is free in the cytoplasm or part of a polysome, then the protein will be used in the cytoplasm. If the ribosome is embedded in RER, then the protein will be put into a vesicle and may eventually be secreted like a protein hormone or digestive enzyme (via the secretory pathway) or be put into a lysosome as a hydrolytic enzyme and used for intracellular digestion.

11. Mutations have their greatest impact if they occur during replication when they have the potential to repeatedly produce incorrect proteins (i.e., every time they are used). If incorrect pairing occurs during translation or transcription, then only one molecule of protein is produced incorrectly, and the next time that gene is used, the process more than likely will occur properly.

UNIT D – MEMBRANE STRUCTURE AND FUNCTION